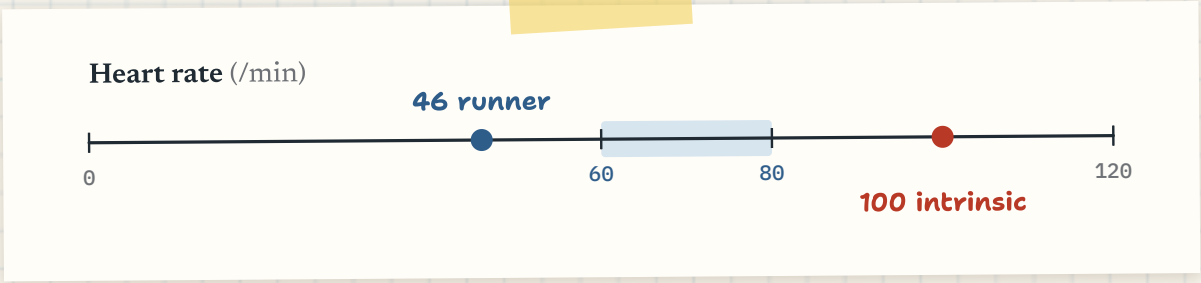
SA node pacemaker potential

Rate = slope of phase 4



Step by step

1. Phase 4: funny current, falling K^+, T-type then L-type Ca^{2+}
2. Threshold at about −40 to −30 mV
3. Phase 0: L-type Ca^{2+} (no fast Na^+)
4. Phase 3: K^+ leaves, back to about −60 mV

Input	Mechanism	Slope
Vagus	ACh opens K^+ channels	Flatter, slower rate
Sympathetic	NE on β_1 opens Na^+ and Ca^{2+}	Steeper, faster rate

Autonomic control of the phase 4 slope

RESTING HEART RATE

intrinsic rate (≈ 100/min) − vagal brake

typical resting rate 60–80/min; teaching simplification

Rule of thumb

Steeper slope, sooner threshold, faster rate

Vagus flattens the slope; sympathetic steepens it

No fast Na^+ channels, no plateau

Exam traps

- The node has no fast Na^+ channels: phase 0 is L-type Ca^{2+}.
- No plateau in nodal cells.
- Rate is set by phase 4 slope, not by the upstroke.

SA node pacemaker potential: phase 4 sets the heart rate

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/heart-sounds-murmurs-ecg/sa-node-pacemaker-potential

For exam study only, not medical advice. Follow local guidelines and your lab's ranges.
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